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ABSTRACT

This study examined the psychometric and technical characteristics of various measures of attention deficit hyperactivity disorder (ADHD) that are commonly used with preschool-aged children. Information on reliability, validity, norms, and scale-specific features was gathered from the test manuals of four commonly used behavior rating scales: (1) Early Childhood Attention Deficit Disorders Evaluation Scale (S. McCarney, 1995); (2) Behavior Assessment System for Children (C. Reynolds and R. Kamphaus, 1994); (3) Connors' Rating Scales-Revised (C. Connors, 1990); and (4) ADHD Rating Scale-IV (G. DuPaul, T. Power, A. Anastopoulous, and R. Reid, 1998). Although most of the test manuals reviewed provided sufficient evidence of reliability and validity for ages 5 and up, many did not provide sufficient detail about psychometric data from preschoolers. In many cases, psychometric information relevant to assessment with preschoolers was presented but was grouped with data from other age groups (e.g., ages 4-11). Furthermore, because the scales reviewed in this article differed in terms of various special features, such as validity scales and clinical norms, clinicians should carefully consider the match between the purposes of the assessment and the instrument used. (Contains 4 tables and 11 references.) (Author/SLD)

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A Psychometric Review of Measures of ADHD in Early Childhood

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Abstract

Behavior rating scales provide valuable normative information in the assessment of ADHD and have typically shown good psychometric properties with school-age children (age 5 and up). However, relatively little is known about the use of these measures with younger children (ages 2 – 5). In the present study, we examined the psychometric and technical characteristics of various published measures of ADHD that are commonly used with preschool aged children. Information on reliability, validity, norms, and scale-specific features was gathered from the test manuals of four commonly used behavior ratings scales. Although most test manuals reviewed in this study provided sufficient evidence of reliability and validity for ages 5 and up, many did not provide sufficient detail about psychometric data with preschoolers. In many cases, psychometric information relevant to assessment with preschoolers was presented but was grouped together with data from other age groups (e.g., 4-11). Furthermore, because the scales reviewed in this article differed in terms of various special features (e.g., validity scales, clinical norms), clinicians should carefully consider the match between the purpose of the assessment and the instrument used.

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A Psychometric Review of Measures of ADHD in Early Childhood.

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Introduction

Attention Deficit Hyperactive Disorder (ADHD) is a chronic behavior disorder characterized by abnormally high levels of impulsivity, inattention, and hyperactivity. (American Psychiatric Association, 1994). It is one of the most frequently diagnosed disorders of childhood, occurring with a prevalence rate of 3% to 5% and is diagnosed more often in boys than girls (Pelham, Wheeler, & Chronis, 1998). Power and DuPaul (1996) suggest that over the past 10 years there have been some important modifications in the existing knowledge of ADHD. The treatment of ADHD in school aged children has focused on behavioral, pharmacological, cognitive, and nutritional interventions. Pisterman et al. (1992) report that numerous outcome studies have been conducted, and short-term benefits have been consistently found for behavioral and pharmacological treatments. However, much of this research focuses on children above the age of five.

Some research has shown that a subgroup of ADHD children demonstrating hyperactivity may be diagnosed as early as 2.5 to 5 years of age (Wender, 1987). Early identification of ADD/ADHD symptoms may allow us to develop goals and intervention strategies to maximize the child's potential. However, accurate assessment and diagnosis of ADHD in early childhood is often difficult (McCarney, 1995). It is more difficult at these ages to distinguish between normal and abnormal levels of hyperactivity, impulsivity and inattention. As a result, clinicians rely heavily on behavior rating scales to help screen for ADHD. These questionnaires are indispensable as a source of assessment data because they provide normative information from parents and teachers regarding the child's behavior. Miles (2000) found that, among school psychologists, behavior rating scales are the most widely used assessment instruments. The most frequently reported scales were the Connors instruments (Conners, 1990), the BASC (Reynolds & Kamphaus, 1994), ADDES (McCarney, 1995), and CBCL (Achenbach, 1991). These measures have typically shown good psychometric properties with school-age children (age 5 and up). However, relatively little is known about the properties of these measures with younger children (ages 2 – 5). Furthermore, each scale has unique features that may make it more appropriate for specific uses. Unfortunately, little information is available for clinicians to help them select the most appropriate behavior rating scale for children under the age of 6.

In the present study, we will examine the psychometric and technical characteristics of various published measures of ADHD with preschool aged children. In addition, we will highlight important features that distinguish among the various behavior rating scales so that clinicians can more effectively select measures that will be most useful for assessment of ADHD in children under the age of 6.

Method

Measures

The following commonly used behavior rating scales were evaluated:

- The *Early Childhood Attention Deficit Disorders Evaluation Scale* (ECADDES) (McCarney, 1995).
- *The Behavior Assessment System for Children (BASC)* (Reynolds & Kamphaus, 1994).
- The *Conners' Rating Scales-Revised* (Conners, 1990).
- *ADHD Rating Scale-IV* (DuPaul, Power, Anastopoulous, Reid, 1998).

Evaluation Criteria: For each of the measures above, the accompanying test manual was examined for information on the following criteria:

Reliability: Reliability refers to the extent to which test scores are free from errors of measurement (AERA, 1985). Consistent with the recommendations of Hammill et al. (1994) the following estimates of reliability were evaluated: Internal Consistency, Test-retest Reliability, Interrater Reliability. Anastasi (1982) recommends a reliability coefficient of .80 or above as being indicative of good reliability for a brief test.

Validity: Validity refers to how well a test measures the characteristics or dimensions it purports to measure. AERA (1985) recommend ideal validation would be demonstrated in three dimensions: construct validity, criterion-related validity, and content validity.

Quality of the Norms: Using guidelines presented by Hammill et al. (1994), the standardization sample of each measure was analyzed by reviewing the size of the normative group, the match of demographic characteristics of the normative group to the U.S. population and the recency of normative data.

Scale Features: In addition to the psychometric characteristics of behavior ratings scales, psychologists must also consider the specific purpose for which an assessment tool is to be used. In the case of behavior rating scales, each scale typically has several unique features that may make it more or less desirable for a specific purpose. Specifically, we noted the presence or absence of several specific features that may influence clinicians' decisions to use a particular measure. These features included:

- Test Length - Number of items for the entire scale as well as for the ADHD specific components (if different than the total scale).
- DSM-IV Criteria - Were the items derived from or closely linked to the DSM-IV diagnostic criteria for ADHD?

- Inattention and Hyperactivity/Impulsivity Subscales - Does the test allow for differentiation of the two primary clusters of ADHD symptoms? This information is important for determining the ADHD subtype.
- Clinical Norms - Does the scale offer clinical norms in addition to general norms? This information may be helpful when a child's behavior problems are extreme in a comparison with age peers. This assists in controlling for ceiling effects and in making differential diagnosis.
- Validity Scales - Does the scale allow the clinician to assess the extent to which respondents are attempting to minimize or exaggerate the severity of the child's symptoms?

Results and Discussion

Reliability (see Table 1)

- All scales have good internal consistency and stability. Inter-rater agreement was lower, but this is expected due to true situational differences between home and school or between parents.
- Some estimates of reliability differ across age ranges (e.g., 2-3 yr old vs. 4-5). The clinician should take this into consideration when interpreting scores. In many cases, these differences are hard to decipher because many test manuals do not present reliability information across age groups.

Validity (see Table 1)

- With regard to content validity, all scales tap relevant problem behaviors. However, not all of the tests were based directly on the DSM-IV criteria. None of the scales were linked directly to a specific theory of ADHD.
- Construct validity - All manuals provided a discussion of convergent and discriminant validity. In some cases, the evidence was broad and did not refer to the scales specific to ADHD.
- Some validity information was only available for certain age ranges. It was often unclear as to whether the scale possesses similar psychometric properties for preschool ages.
- Criterion validity - All manuals presented adequate evidence of criterion validity. However, it was often difficult to decipher which results were applicable to preschool age children specifically.

Quality of Norms

- Most scales had adequate standardization for ADHD with a preschool age population (see Table 2)
- Generally representative of the US population, with some exceptions
- Some did not provide information on the break down across each age group
- Ages covered by scales varied with few providing norms across the entire 2-6 range (see Table 3).

Scale Features (see Table 4)

- Only one scale (BASC) included a validity scale (e.g., Fake Bad). Depending on the purpose of the assessment (custody evaluation, special education placement), this information could be extremely important.
- Tests varied considerably in length and specificity. BASC, and Conners are broad-band rating scales that evaluate characteristics other than ADHD symptoms, but take longer. ADHD-IV and ECADDES may be preferable when only information about ADHD related symptoms is needed.
- Separate inattention and hyperactivity/impulsivity scales may be important for making accurate diagnosis of ADHD subtypes. All rating scales made this distinction, although not all linked this distinction to DSM-IV criteria.
- BASC is only test to provide clinical norms, which may be preferable when there is a particular concern over ceiling effects and/or differential diagnosis.

Summary

Evaluation of measures is a complex process that involves an interaction between the psychometric and practical utility of the scale. Although most test manuals reviewed in this study provided sufficient evidence of reliability and validity for ages 5 and up, many did not provide sufficient detail about psychometric data with preschoolers. In many cases, psychometric information relevant to assessment with preschoolers was presented but was grouped together with data from other age groups (e.g., 4-11). For behavior rating scales to be helpful for assessment of preschoolers, more detailed information of the psychometric properties of these scales with this population is necessary. Furthermore, because the scales reviewed in this article differed in terms of various special features (e.g., validity scales, clinical norms), clinicians should carefully consider the match between the purpose of the assessment and the instrument used.

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Table 1. Psychometric Characteristics of the ADHD Rating Scales for preschoolers

	Reliability			Validity Evidence in Manual?		
Scale	Internal Reliability	Test-Retest	Inter-Rater	Discriminant Validity	Criterion Validity	Content Validity
ADHD-IV- Parent[a]				Y	Y	Y
Total	.92	.85	.41[b]			
Inattention	.86	.78	.45[b]			
Hyper/Imp	.88	.86	.40[b]			
ADHD-IV- School[a]				Y	Y	Y
Total	.94	.90	.41[b]			
Inattention	.96	.89	.45[b]			
Hyper/Imp	.88	.88	.40[b]			
BASC-Parent				Y[c]	Y[c]	Y
Inattention	.70	.88	.61			
Hyperactivity	.83	.88	.72			
BASC-Teacher				Y[c]	Y[c]	Y
Inattention	.89	.85	.63			
Hyperactivity	.87	.92	.54			
Conners- Parent[d]						
ADHD Index	.91	NA	NA	N	N	N
DSM-IV Inattentive	.90					
DSM-IV Hyper/Imp	.88					
Conners- Teacher[d]						
ADHD Index	.92	NA	NA	N	N	N
DSM-IV Inattentive	.90					
DSM-IV Hyper/Imp	.88					
ECADDES- Home				Y	Y	Y
Total	.98	.87	.71			
Inattentive	.96	.87				
Hyper/Imp	.97	.88				
ECADDES- School				Y	Y	Y
Total	.99	.96	.67			
Inattentive	.98	.96				
Hyper/Imp	.99	.98				

Note. When more than one reliability coefficient was reported in the manual, the median is presented. ADHD-IV = ADHD Rating Scale- IV; BASC = Behavior Assessment System for Children; Conners = Conners' Rating Scales-Revised; ECADDES = Early Childhood Attention Deficit Disorders Evaluation Scale.

[a] data based on ages 5-6 only

[b] inter-rater reliability of parent and teacher.

[c] only for ages 4 and up

[d] Numbers represent data for ages 3 - 5. Other psychometric information (missing numbers) not broken down specifically for ages 3-5 in the manual.

Table 2. Characteristics of Standardization Sample for ADHD Rating Scales

Scale	Sample Size	Mean N Per One Year Interval	Publication/ Standardization Year	Represent U.S. Population
ADHD-IV- Parent	667	222.3	1998	Y
ADHD-IV- School	454	151.3	1998	Y
BASC-Parent	309	154.5	1992/1998[a]	Y
BASC-Teacher	333	166.5	1992/1998[a]	Y
Conners- Parent[b]	375	125.0	1997	Y
Conners- Teacher[b]	198	66.0	1997	Y
ECADDES- Home	1,896	379.2	1995	N[c]
ECADDES- School	2,887	577.4	1995	N[c]

Note. ADHD-IV = ADHD Rating Scale- IV; BASC = Behavior Assessment System for Children; Conners = Conners' Rating Scales-Revised; ECADDES = Early Childhood Attention Deficit Disorders Evaluation Scale.

[a] 2 sets of general norms were combined. 1992 data was for 4 years- 5 years 11 months, 1998 data was for 2 years 6 months through 3 years 11 months.

[b] long form data used for analysis purposes.

[c] low percentage of minority children relative to U.S. population

Table 3. Ages covered by norms of ADHD Rating Scales

	Age (years)				
Scale	2	3	4	5	6
ADHD-IV- Parent	N	N	N	Y	Y
ADHD-IV- School	N	N	N	Y	Y
BASC-Parent	Y[a]	Y	Y	Y	Y
BASC-Teacher	Y[a]	Y	Y	Y	Y
Conners- Parent[b]	N	Y	Y	Y	Y
Conners- Teacher[b]	N	Y	Y	Y	Y
ECADDES- Home	Y	Y	Y	Y	Y
ECADDES- School	Y	Y	Y	Y	Y

Note. ADHD-IV = ADHD Rating Scale- IV; BASC = Behavior Assessment System for Children; Conners = Conners' Rating Scales-Revised; ECADDES = Early Childhood Attention Deficit Disorders Evaluation Scale.

[a] available for ages 2-6 to 2-11.

Table 4. ADHD Rating Scale Features

Scale	Total # Items	# ADHD Items	Derived From DSM-IV?	Separate Inattention & Hyp/Imp scales?	Clinical Norms?	Validity Scale(s)[a]
ADHD-IV- Parent	18	18	Y	Y	N	N
ADHD-IV- School	18	18	Y	Y	N	N
BASC-Parent	208	23	N	Y	Y	B
BASC-Teacher	206	17	N	Y	Y	B
Conners- Parent	10 - 87[b]		Y	Y	N	N
Conners- Teacher	10 - 87[b]		Y	Y	N	N
ECADDES- Home	50	50	Y	Y	N	N
ECADDES- School	56	56	Y	Y	N	N

Note. ADHD-IV = ADHD Rating Scale- IV; BASC = Behavior Assessment System for Children; Conners = Conners' Rating Scales-Revised; ECADDES = Early Childhood Attention Deficit Disorders Evaluation Scale.

[a] G = Fake Good, B = Fake Bad, N = No Validity Scale

[b] range of items available depending on version chosen